VXD alignment in basf2 - status

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Outline

Millepede algorithm
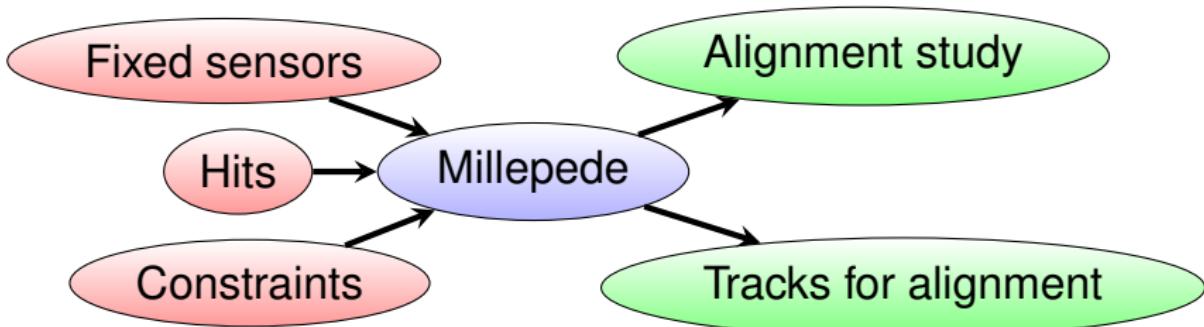
- **Constraints** fix the otherwise undefined degrees of freedom corresponding to global translations and rotations of VXD. They are realized by requiring that the sum of alignment correction per each parameter (projected to global system) is zero. We use them because otherwise we would need to fix some sensor.
- **TrueHits** are MC simulation objects, they are the records of passage of simulated particles through a sensor.
- **Clusters** are reconstruction objects. They represent reconstructed hits based on fired pixels or strips.

Procedure

- Generation of samples:
    1. Upsilon(4S) (60 000 events)
    2. Cosmics generator (60 000 events)
    3. Pair of muons from $Z^0 \to \mu^+ + \mu^-$ (30 000 events)
- Merging of 20 samples
- 10 independent simulations ($\sim$ 200 samples)
- Outputs:
    - Mean value with standard deviation (std)
    - Standard deviation of Millepede algorithm (std_mille)

Geometry of sensors and parameters

- All sensors at ideal position (without misalignment)
- Using constraints
- Local parameters for each sensor:
    1. Shifts: *u*, *v*, *w*
    2. Rotations: α, β, γ
- Mean value as bias (difference between ideal and calculated position)
- 212 sensors $\times$ 6 parameters $=$ 1272 parameters
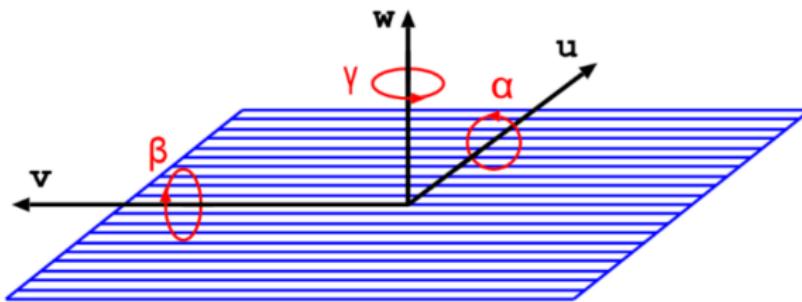
Alignment convergence study

Layer 4, ladder 1: → *sensor 1* → *sensor 2* → *sensor 3*
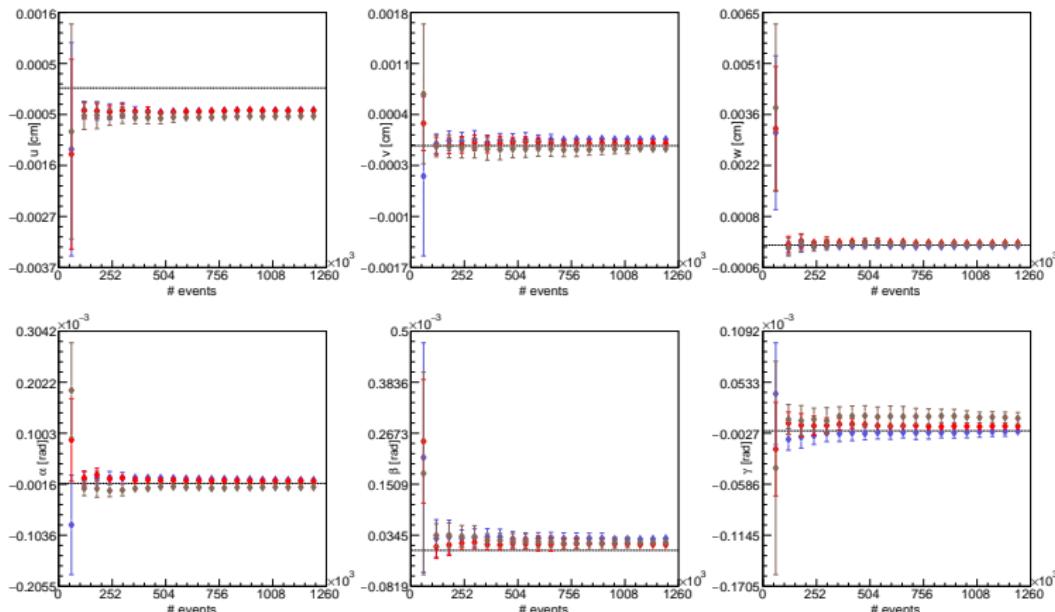
There are mixture of Upsilon and Cosmics samples.
The samples do not converge to expected values

Bias of parameter du for alignment
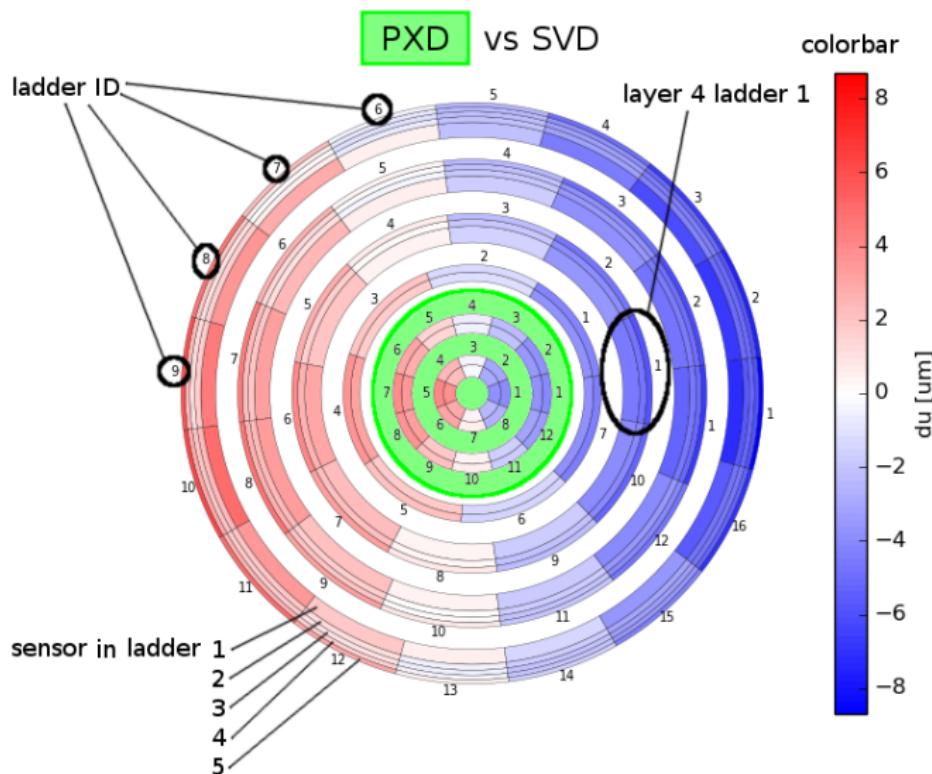
Bias of all parameters for alignment
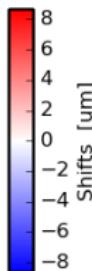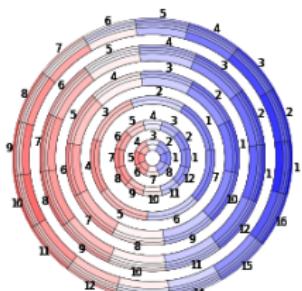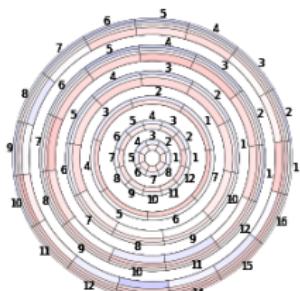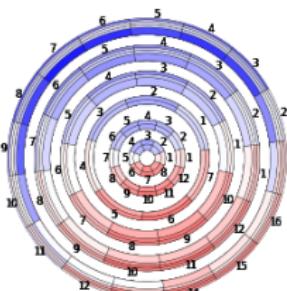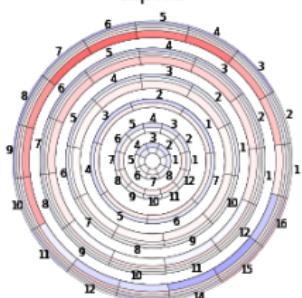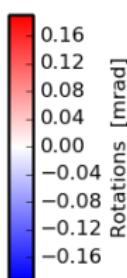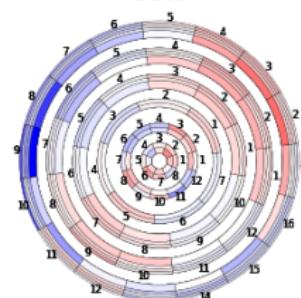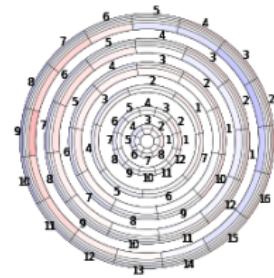
Upsilon (600 000 events) + Cosmics (600 000 events)

Bias of all parameters for alignment
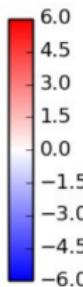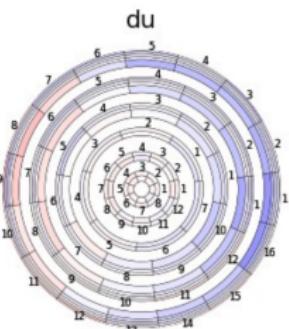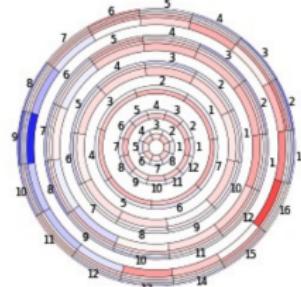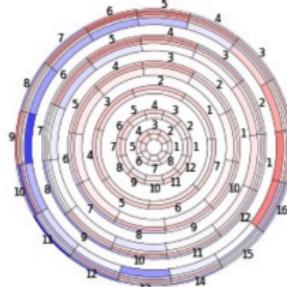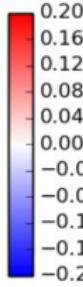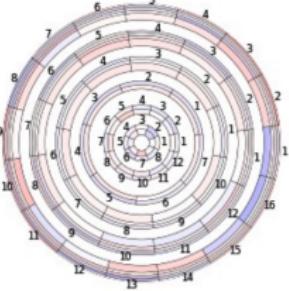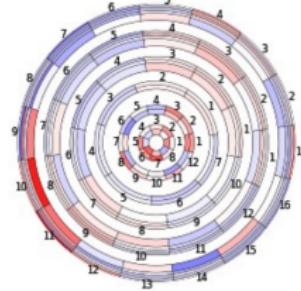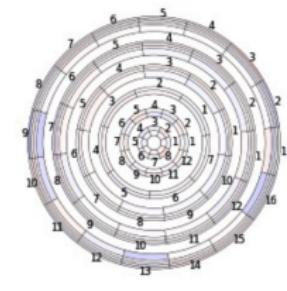
Upsilon (1 000 000 events) + Cosmics (1 000 000 events) +
+ Muons (50 000 events)

Status

Inssues

- Find proper mixture and size of alignment data
- Find proper constraints
- Comparison between Clusters and TrueHits

Plans

- Changing constraints for fixed CDC wires

Study of impact on tracking parameters

Backup

# The ladder numbering of VXD
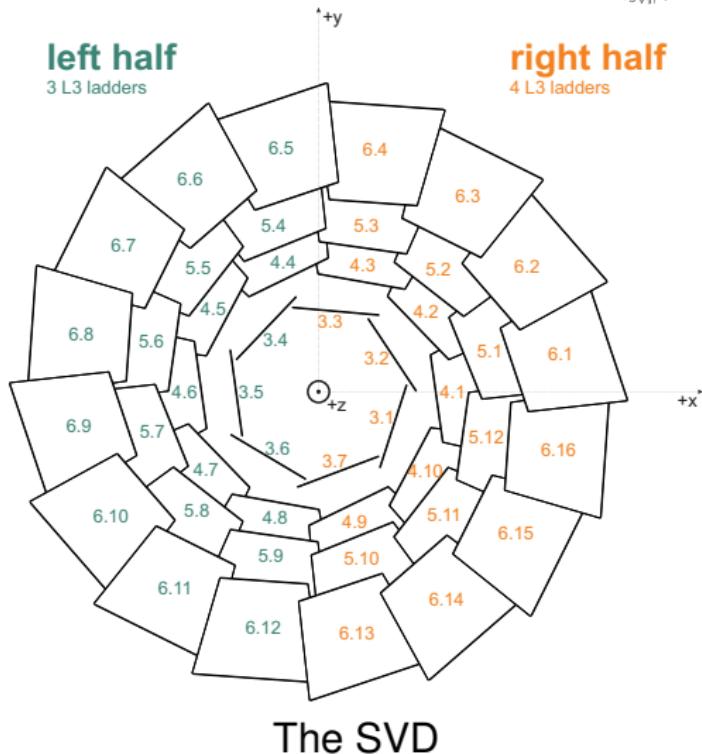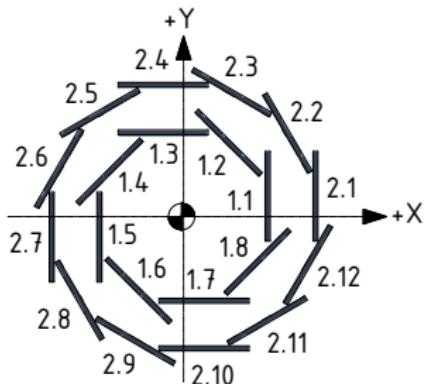
The PXD

The SVD

The sensor numbering of VXD

The PXD

The SVD